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☐ 1. Document ID: US 5729141 A Relevance Rank: 62

L5: Entry 3 of 7 File: USPT Mar 17, 1998

US-PAT-NO: 5729141
DOCUMENT-IDENTIFIER: US 5729141 A

TITLE: Split gradient coils for MRI system

DATE-ISSUED: March 17, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hass; Mathew Arnold	Andover	MA		
Domigan; Paul	Andover	MA		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Intermagnetics General Corporation	Latham	NY			02

APPL-NO: 8/ 616492
DATE FILED: March 19, 1996

INT-CL: [6] G01 V 3/00

US-CL-ISSUED: 324/318; 324/322
US-CL-CURRENT: 324/318; 324/322

FIELD-OF-SEARCH: 324/318, 324/322, 324/314, 324/300, 324/307, 324/309, 128/653.5

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
5021739	June 1991	Yokosawa et al.	324/248
5256972	October 1993	Keren et al.	324/318
5365172	November 1994	Hrovat et al.	324/309
5386191	January 1995	McCarten et al.	324/318
5424643	June 1995	Morich et al.	324/318
5572129	November 1996	Carlson	324/318
5574373	November 1996	Pausch et al.	324/318
5585724	December 1996	Morich et al.	324/318

OTHER PUBLICATIONS

Carlson et al, "Design and Evaluation of Shielded Gradient Coils", 1992, pp. 191-206.

ART-UNIT: 225
PRIMARY-EXAMINER: Arana; Louis M.
ATTY-AGENT-FIRM: Helfgott & Karas, P C.

ABSTRACT:

In a magnetic resonance imaging system, wherein a subject to be imaged is supported within a bore of a magnet assembly and exposed to radio frequency (RF) energy emitted from an excitation coil, gradient coils and an RF screen are disposed within the region of the bore exteriorly to an excitation coil and are configured with a split or open region facing sections of the excitation coil for reduced image currents in the gradient coils and the RF screen from RF field generated by the excitation coil. The X gradient coil is reduced to two enlarged coil sections to the left and to the right of the bore. The two opposed sections of the X gradient coil, the two opposed sections of the Y gradient coil, and the opposed pairs of sections of the Z gradient coil are spaced apart at the top and the bottom of the bore for reduced interaction with the excitation coil section located at the top and the bottom of the bore. Thereby, the space between the excitation coil and the shield can be reduced. A more accurate image is developed with greater efficiency in terms of electric power.

8 Claims, 17 Drawing figures

☐ 2. Document ID: US 5886548 A Relevance Rank: 61

L5: Entry 2 of 7 File: USPT Mar 23, 1999

US-PAT-NO: 5886548
DOCUMENT-IDENTIFIER: US 5886548 A

TITLE: Crescent gradient coils

DATE-ISSUED: March 23, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Doty; F. David	Columbia	SC		
Wilcher; James K.	Columbia	SC		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Doty Scientific Inc.	Columbia	SC			02

APPL-NO: 8/ 608906
DATE FILED: February 29, 1996

PARENT-CASE:
This application is a divisional of application Ser. No. 08/030,853, filed on Mar. 12, 1993, now U.S. Pat. No. 5,554,929 incorporated herein by reference.

INT-CL: [6] G01 V 3/00

US-CL-ISSUED: 324/318
US-CL-CURRENT: 324/318

FIELD-OF-SEARCH: 324/318, 324/322, 335/299, 335/300, 335/301, 128/653.5

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
2354331	July 1944	Polydoroff	175/242
2498475	February 1950	Adams	324/318
3237090	February 1966	Royer et al.	323/45
3466499	September 1969	Beth	313/84
3569823	March 1971	Golay	324/300
3671902	June 1972	Westendorp	336/84
3924211	December 1975	Joffe et al.	335/284
4038622	July 1977	Purcell	335/216
4165479	August 1979	Mansfield	324/300
4514586	April 1985	Waggoner	175/35
4642569	February 1987	Hayes et al.	324/318
4646024	February 1987	Schenck et al.	324/318
4646046	February 1987	Vavrek et al.	335/301
4652824	March 1987	Oppelt	324/318
4707663	November 1987	Minkoff et al.	324/319
4733189	March 1988	Punchard et al.	324/318
4737716	April 1988	Roemer et al.	324/319
4766383	August 1988	Fox et al.	324/318
4768008	August 1988	Purcell et al.	335/318
4820988	April 1989	Crooks et al.	324/318
4849697	July 1989	Cline et al.	324/306
4876510	October 1989	Siebold et al.	324/318
4885440	December 1989	Snoddy et al.	324/318
4910462	March 1990	Roemer et al.	324/318
4920011	April 1990	Ogawa et al.	428/576
4926125	May 1990	Roemer	324/318
4935714	June 1990	Vermilyea	335/299
4954781	September 1990	Hirata	324/318
4965521	October 1990	Egloff	324/312
4978920	December 1990	Mansfield	324/318
5036282	July 1991	Morich et al.	324/318
5061891	October 1991	Totsuka et al.	324/146
5084676	January 1992	Saho et al.	324/318
5132618	July 1992	Sugimoto	324/318
5132621	July 1992	Kang et al.	324/322
5166619	November 1992	Ries	324/318
5185577	February 1993	Minemura	324/318
5198769	March 1993	Frese et al.	324/318
5225782	July 1993	Laskaris et al.	324/318
5235283	August 1993	Lehne et al.	324/318
5278502	January 1994	Laskaris et al.	324/318
5289128	February 1994	DeMeester et al.	324/318
5296810	March 1994	Morich	324/318
5349297	September 1994	DeMeester et al.	324/318
5406204	April 1995	Morich et al.	324/318
5424643	June 1995	Morich et al.	324/318
5489848	February 1996	Furukawa	324/318
5554929	September 1996	Doty et al.	324/318

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	US-CL
304126	February 1989	EPX	
586983	March 1994	EPX	
4029477	April 1991	DEX	
54-3879	February 1979	JPX	
2050062	December 1980	GBX	

OTHER PUBLICATIONS

E.C. Wong et al., Magnetic Resonance in Medicine, vol. 21, 1 Sep. 1991, pp. 39-48.
V. Bangert et al., Journal of Physics E: Scientific Instuments, vol. 15, 1 Feb. 1982, pp. 235-239.
J.P. Boehmer et al., Journal of Magnetic Resonance, vol. 83, 1 Jun. 1989, pp. 152-159.
Y. Bangert and P. Mansfield, J. Physics E 15, "Magnetic Field Gradient Coils for NMR Imaging," 235 (1982).
P. Mansfield and B. Chapman, J. Magnetic Resonance 66, "Active Magnetic Screening of Gradient Coils in NMR Imaging," 573-576 (Feb. 1986).
P. Mansfield and B. Chapman, J. Magnetic Resonance 72, "Multishield Active Magnetic Screening of Coil Structures in NMR," 211 (1987).
M.K. Stehling, R. Turner, P. Mansfield, Science 254, "Echo-Planar Imaging: Magnetic Resonance Imaging in a Fraction of a Second," 43 (1991).

ART-UNIT: 225
PRIMARY-EXAMINER: Arana; Louis M.
ATTY-AGENT-FIRM: Oppedahl & Larson

ABSTRACT:

A high-conductivity ceramic coil form with an internal water jacket is used to simplify water cooling for 3-axis MRI gradient coil configurations on a single cylindrical coilform. Crescent-shaped, axially aligned coils are symmetrically employed on either side of the axial symmetry plane to increase transversely the region of field linearity. These crescent coils may be used in conjunction with Golay-type coils for improved switching efficiency. Lead-filled copper tubing may be used to reduce acoustic noise from pulsed coils in high external magnetic fields.

13 Claims, 17 Drawing figures

☐ 3. Document ID: US 5406204 A Relevance Rank: 57

L5: Entry 4 of 7 File: USPT Apr 11, 1995

US-PAT-NO: 5406204
DOCUMENT-IDENTIFIER: US 5406204 A

TITLE: Integrated MRI gradient coil and RF screen

DATE-ISSUED: April 11, 1995

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Morich; Michael A.	Mentor	OH		
DeMeester; Gordon D.	Wickliffe	OH		
Patrick; John L.	Chagrin Falls	OH		
Zou; Xueming	Chesterland	OH		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Picker International, Inc.	Highland Hts.	OH			02

APPL-NO: 8/ 080413
DATE FILED: June 21, 1993

PARENT-CASE:
The present application is a continuation-in-part of U.S. applications Ser. Nos. 07/942,521, filed Sep. 9, 1992, 07/859,152, filed Mar. 27, 1992, and 07/859,154, filed Mar. 27, 1992.

INT-CL: [6] G01 R 33/20

US-CL-ISSUED: 324/318
US-CL-CURRENT: 324/318

FIELD-OF-SEARCH: 335/266, 324/300, 324/307, 324/309, 324/310, 324/311, 324/312, 324/313, 324/314, 324/318, 324/319, 324/320, 324/322, 128/653.2, 128/653.5

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4587504	May 1986	Brown et al.	335/216
4703275	October 1987	Holland	324/318
4733189	March 1988	Punchard et al.	324/318
4737716	April 1988	Roemer et al.	324/319
4761612	August 1988	Holland et al.	324/307
4871969	October 1989	Roemer et al.	324/318
4978920	December 1990	Mansfield et al.	324/318
5083085	January 1992	Morad	324/318
5179338	January 1993	Laskaris et al.	324/318
5278502	January 1994	Laskaris et al.	324/318
5289128	February 1994	De Meester et al.	324/318

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	US-CL
2180943	September 1985	GBX	

OTHER PUBLICATIONS

"Active Magnetic Screening of Gradient Coils in NMR Imaging", Mansfield, et al., Journal of Magnetic Resonance, 66, 573-576 (1986).
"Active Magnetic Screening of Coils For Static and Time-Dependent Magnetic Field Generation in NMR Imaging", Mansfield, et al., J. Phys. E. Sci. Instrum. 19, 540-544 (1986).
"Shielded Gradient Coils and Radio Frequency Probes for High-Resolution Imaging of Rat Brains", Jasinski, et al, Magnetic Resonance in Medicine, 24, 29-41 (1992).
"A 60 cm Bore 2.0 Tesla High Homogeneity Magnet For Magnetic Resonance Imaging",

Bobrov, et al., IEEE Transactions on Magnetics, vol. MAG-23, No. 2, Mar. 1987.

ART-UNIT: 267
PRIMARY-EXAMINER: Tokar; Michael J.
ATTY-AGENT-FIRM: Fay, Sharpe, Beall, Fagan, Minnich & McKee

ABSTRACT:

The magnetic field assembly of a magnetic resonance imaging device includes an annular superconducting magnet (10) which is mounted within a toroidal vacuum vessel (24). A cylindrical member (26) defines a central bore through which the superconducting magnets generate a temporally constant primary magnetic field. A cylindrical, dielectric former (46) is mounted in the bore displaced a small distance from the cylindrical member. A radio frequency coil (32) is mounted within the cylindrical member defining a patient receiving examination region. An RF shield (34) is mounted around the exterior peripheral surface of the former. Primary gradient coils (40) are mounted around and potted to the exterior of the dielectric former around the RF shield. Gradient shield or secondary coils (44) are potted around an exterior of the cylindrical member within the vacuum chamber. As illustrated in FIG. 3 , when unshielded gradient coils are used, the primary gradient coils and the RF shield are mounted around the outer diameter of the cylindrical member (26).

20 Claims, 3 Drawing figures

☐ 4. Document ID: US 5311135 A Relevance Rank: 56

L5: Entry 7 of 7 File: USPT May 10, 1994

US-PAT-NO: 5311135
DOCUMENT-IDENTIFIER: US 5311135 A

TITLE: Multiple tap gradient field coil for magnetic resonance imaging

DATE-ISSUED: May 10, 1994

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Vavrek; Robert M.	Waukesha	WI		
Myers; Christopher C.	Milwaukee	WI		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
General Electric Company	Milwaukee	WI			02

APPL-NO: 7/ 988986
DATE FILED: December 11, 1992

INT-CL: [5] G01V 3/00

US-CL-ISSUED: 324/318; 324/322
US-CL-CURRENT: 324/318; 324/322

FIELD-OF-SEARCH: 324/318, 324/322, 324/307, 324/309, 324/300, 128/653.5, 335/299, 335/296, 336/137, 336/150

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4636728	January 1987	Compton et al.	324/318
4646024	February 1987	Schenck et al.	324/318
4656447	April 1987	Keim et al.	335/216
4737716	April 1988	Roemer et al.	324/319
4794338	December 1988	Roemer et al.	324/39
4840700	June 1989	Edelstein et al.	156/634
5130656	July 1992	Requardt et al.	324/318
5227728	July 1993	Kaufman et al.	324/318
5235279	October 1993	Kaufman et al.	324/318

ART-UNIT: 267
PRIMARY-EXAMINER: Arana; Louis
ATTY-AGENT-FIRM: Quarles & Brady

ABSTRACT:

An NMR imaging system includes an apparatus for producing a magnetic field gradient within an imaging volume into which the object being imaged is placed. The relatively linear region of the magnetic field gradient is adjusted depending upon the size of the object. The apparatus comprises a source of a gradient signal and four saddle coils positioned in quadrant of a sheet that is wrapped around a cylindrical form. Each saddle coil has a spiral shaped conductive pattern on which are located a primary termination point and a pair of secondary termination points. A switch mechanism connects the four saddle coils in series with the source of a gradient signal, so that voltage from the gradient signal is applied between the primary termination point and a selected secondary termination point of each saddle coil. A control signal applied to the switch mechanism indicates selected secondary termination point and the signal varies according to the size of the object.

11 Claims, 9 Drawing figures

☐ 5. Document ID: US 5372137 A Relevance Rank: 48

L5: Entry 5 of 7 File: USPT Dec 13, 1994

US-PAT-NO: 5372137
DOCUMENT-IDENTIFIER: US 5372137 A

TITLE: NMR local coil for brain imaging

DATE-ISSUED: December 13, 1994

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Wong; Eric C.	Wauwatosa	WI		
Hyde; James S.	Dousman	WI		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
The MCW Research Foundation, Inc.	Milwaukee	WI			02

APPL-NO: 8/ 006219
DATE FILED: January 19, 1993

INT-CL: [5] A61B 5/055, G01R 33/48

US-CL-ISSUED: 128/653.5; 324/309, 324/318
US-CL-CURRENT: 600/422; 324/309, 324/318

FIELD-OF-SEARCH: 128/653.2, 128/653.5, 324/309, 324/318, 324/322, 336/225

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4680548	July 1987	Edelstein et al.	324/318
4725781	February 1988	Roschmann	324/318
4924184	May 1990	Yoda	324/318
4939465	July 1990	Biehl et al.	324/318
4992737	February 1991	Schnur	324/318
5235279	August 1993	Kaufman et al.	324/318

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	US-CL
5042123	February 1993	JPX	128/653.5

OTHER PUBLICATIONS

An Efficient, Highly Homogeneous Radiofrequency Coil for Whole-Body NMR Imaging at 1.5T, Jour. of Magnetic Resonance, 63, 622-628 (1985), Hayes et al.
High-Resolution, Short Echo Time MR Imaging of the Fingers and Wrist with a Local Gradient Coil.sup.1, Radiology, vol. 181, No. 2, Nov. 1992, Wong et al.
Coil Optimization for MRI by Conjugate Gradient Descent, Mag. Resonance in Medicine, 21, 39-48 (1991), Wong et al.

ART-UNIT: 335
PRIMARY-EXAMINER: Pfaffle; K. M.
ATTY-AGENT-FIRM: Quarles & Brady

ABSTRACT:

A local RF and gradient coil for acquiring images of the human brain using fast NMR pulse sequences includes an end capped RF bird cage coil surrounded by a 3 axis gradient coil assembly. An RF shield is disposed between the RF coil and the gradient coils and it is divided into separate segments to reduce eddy currents induced by the changing gradient fields.

28 Claims, 11 Drawing figures

☐ 6. Document ID: US 6157276 A Relevance Rank: 46

L5: Entry 1 of 7 File: USPT Dec 5, 2000

US-PAT-NO: 6157276
DOCUMENT-IDENTIFIER: US 6157276 A

TITLE: MRI magnet assembly with non-conductive inner wall

DATE-ISSUED: December 5, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hedeen; Robert Arvin	Clifton Park	NY		
Edelstein; William Alan	Schenectady	NY		
El-Hamamsy; Sayed-Amr	Schenectady	NY		
Herd; Kenneth Gordon	Niskayuna	NY		
Ackermann; Robert Adolph	Schenectady	NY		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
General Electric Company	Schenectady	NY			02

APPL-NO: 9/ 134764
DATE FILED: August 14, 1998

INT-CL: [7] H01 F 6/00

US-CL-ISSUED: 335/216; 324/318, 62/51.1, 505/879, 505/893, 505/898
US-CL-CURRENT: 335/216; 324/318, 505/879, 505/893, 505/898, 62/51.1

FIELD-OF-SEARCH: 335/216, 335/296, 324/318, 324/319, 324/320, 62/51.1, 505/879, 505/892, 505/893, 505/898

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4492090	January 1985	Laskaris	62/55
4642569	February 1987	Hayes et al.	324/318
4771256	September 1988	Laskaris et al.	335/301
4879515	November 1989	Roemer et al.	324/318
4896128	January 1990	Wollan et al.	335/299
4910462	March 1990	Roemer et al.	324/318
4986078	January 1991	Laskaris	62/51.1
5001447	March 1991	Jayakumar	335/299
5034713	July 1991	Herd et al.	335/216
5278502	January 1994	Laskaris et al.	324/318
5489848	February 1996	Furukawa	324/318
5530413	June 1996	Minas et al.	335/216
5635839	June 1997	Srivastava et al.	324/320

ART-UNIT: 282
PRIMARY-EXAMINER: Barrera; Ray
ATTY-AGENT-FIRM: Snyder; Marvin Stoner; Douglas E.

ABSTRACT:

An MR magnet assembly includes a cylindrical vessel for housing a superconducting magnet and having a vacuum between its inner and outer walls. The vessel defines a

magnet bore for receiving a patient to be imaged. A gradient coil assembly is mounted in the bore adjacent the inner wall of the magnet assembly. To reduce gradient coil noise, the inner wall is constructed of a non-conductive material which does not support eddy currents.

5 Claims, 5 Drawing figures

☐ 7. Document ID: US 5367261 A Relevance Rank: 43

L5: Entry 6 of 7 File: USPT Nov 22, 1994

US-PAT-NO: 5367261
DOCUMENT-IDENTIFIER: US 5367261 A

TITLE: Shield for a magnetic resonance imaging coil

DATE-ISSUED: November 22, 1994

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Frederick; Perry S.	Waukesha	WI		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
General Electric Company	Milwaukee	WI			02

APPL-NO: 8/ 194798
DATE FILED: February 14, 1994

PARENT-CASE:
This application is a continuation of application Ser. No. 07/907,891 filed on Jul. 2, 1992 now abandoned.

INT-CL: [5] G01R 33/28

US-CL-ISSUED: 324/318; 324/322
US-CL-CURRENT: 324/318; 324/322

FIELD-OF-SEARCH: 324/318, 324/322, 324/300, 324/314, 324/320, 335/299, 335/301, 336/84R, 336/84C, 336/84M

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4680548	July 1987	Edelstein et al.	324/318
4692705	September 1987	Hayes	324/318
4694255	September 1987	Hayes	324/318
4694663	September 1987	Miller	62/514R
4712067	December 1987	Roschmann et al.	324/318
4771256	February 1988	Laskaris et al.	335/301
4871969	October 1989	Roemer et al.	324/318
4879515	November 1989	Roemer et al.	324/322
4952877	August 1990	Stormont et al.	324/312
4990877	February 1991	Benesch	324/318
4992736	February 1991	Stormont et al.	324/309
5017872	May 1991	Foo et al.	324/322
5132621	July 1992	Kang et al.	324/318
5243286	September 1993	Rzedzian et al.	324/318

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	US-CL
0196511	October 1986	EPX	335/301
9119994	December 1991	WOX	324/318

ART-UNIT: 267
PRIMARY-EXAMINER: Arana; Louis
ASSISTANT-EXAMINER: Mah; Raymond Y.
ATTY-AGENT-FIRM: Quarles & Brady

ABSTRACT:

An NMR imaging apparatus includes an excitation coil with a plurality of conductive elements extending between two spaced-apart end loops to form conventional "birdcage" coil. A shield is provided to reduce interference between the excitation coil and gradient field coils. The shield comprises a first electrically conductive section having an open ring with a gap therein and a plurality of first members extending from the ring with each member terminating at a remote end. A capacitor is connected across the gap in the ring. A second electrically conductive section has another ring from which a like plurality of second members extend with each one terminating at a remote end. The remote end of each second member is spaced from a remote end of a corresponding one of the first members and a capacitor is connected across those remote ends.

15 Claims, 5 Drawing figures

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Drawi Desc | Image

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CONDUCTIVES.DWPI,TDBD,EPAB,JPAB,USPT,PGPB.	122
ELEMENT.DWPI,TDBD,EPAB,JPAB,USPT,PGPB.	2214606
ELEMENTS.DWPI,TDBD,EPAB,JPAB,USPT,PGPB.	1861445
(3 AND (CONDUCTIVE ADJ ELEMENT)).USPT,PGPB,JPAB,EPAB,DWPI,TDBD.	7
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☑ 1. Document ID: US 20020079897 A1 Relevance Rank: 82

L9: Entry 1 of 8 File: PGPB Jun 27, 2002

PGPUB-DOCUMENT-NUMBER: 20020079897
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020079897 A1

TITLE: MRI apparatus

PUBLICATION-DATE: June 27, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Ham, Cornelis Leonardus Gerardus	Eindhoven		NL	
Konijn, Jan	Eindhoven		NL	

US-CL-CURRENT: 324/318; 324/322

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. Desc | Image

☑ 2. Document ID: US 6278275 B1 Relevance Rank: 65

L9: Entry 4 of 8 File: USPT Aug 21, 2001

US-PAT-NO: 6278275
DOCUMENT-IDENTIFIER: US 6278275 B1

TITLE: Gradient coil set with non-zero first gradient field vector derivative

DATE-ISSUED: August 21, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Petropoulos; Labros S.	Solon	OH		
Schlitt; Heidi A.	Chesterland	OH		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Picker International, Inc.	Highland Heights	OH			02

APPL-NO: 9/ 419597
DATE FILED: October 18, 1999

INT-CL: [7] G01 V 3/00

US-CL-ISSUED: 324/318; 324/309, 324/320
US-CL-CURRENT: 324/318; 324/309, 324/320

FIELD-OF-SEARCH: 324/318, 324/309, 324/307, 324/320, 324/300, 335/296

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4794338	December 1988	Roemer et al.	324/39
5132618	July 1992	Sugimoto	324/318
5296810	March 1994	Morich	324/318
5736858	April 1998	Katznelson et al.	324/318
5942898	August 1999	Petropoulos et al.	324/318
5952830	September 1999	Petropoulos et al.	324/318

ART-UNIT: 282
PRIMARY-EXAMINER: Oda; Christine
ASSISTANT-EXAMINER: Shrivastav; Brij B
ATTY-AGENT-FIRM: Fay, Sharpe, Fagan, Minnich & McKee, LLP

ABSTRACT:

A gradient coil assembly (22) generates substantially linear magnetic gradients across the central portion of an examination region (14). The gradient coil assembly (22) includes primary x, y, and z-gradient coils (62, 66, 68) which generate a gradient magnetic field (90) having a non-zero first derivative in and adjacent the examination region. Preferably, the gradient coil assembly (22) includes secondary, shielding x, y, and z coils which generate a magnetic field which substantially cancels, in an area outside a region defined by the shielding coils, a fringe magnetic field generated by the primary gradient coils. The existence of a non-zero first derivative in and adjacent the examination region eliminates aliasing effects attributable to the non-unique gradient field values on either side of a rollover point (82). The non-unique values of the gradient magnetic field adjacent the rollover point caused structure near the rollover point to overlay each other (FIGS. 7B, 8B). The unique non-linearity of the present gradient (90) adjacent the edges expands (magnifies) the image adjacent the edges (FIGS. 7A, 8A). Because the expansion is unique, distortions at the edges are readily and accurately mapped (52) back to linear.

17 Claims, 13 Drawing figures

☐ 3. Document ID: US 6278276 B1 Relevance Rank: 54

L9: Entry 3 of 8 File: USPT Aug 21, 2001

US-PAT-NO: 6278276
DOCUMENT-IDENTIFIER: US 6278276 B1

TITLE: Phased array gradient coil set with an off center gradient field sweet spot

DATE-ISSUED: August 21, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Morich; Michael A.	Mentor	OH		
Retropoulos; Labros S.	Solon	OH		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Picker International, Inc.	Highland Heights	OH			02

APPL-NO: 9/ 441283
DATE FILED: November 16, 1999

INT-CL: [7] G01 V 3/00

US-CL-ISSUED: 324/318; 324/322
US-CL-CURRENT: 324/318; 324/322

FIELD-OF-SEARCH: 324/318, 324/322, 324/300, 324/306, 324/307, 324/309, 600/421, 600/422

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4794338	December 1988	Roemer et al.	324/39
5132618	July 1992	Sugimoto	324/318
5235279	August 1993	Kaufman et al.	324/309
5278504	January 1994	Patrick et al.	324/318
5296810	March 1994	Morich	324/318
5736858	April 1998	Katznelson et al.	324/318
5942898	August 1999	Petropoulos et al.	324/318
5952830	September 1999	Petropoulos et al.	324/318

ART-UNIT: 282
PRIMARY-EXAMINER: Arana; Louis
ATTY-AGENT-FIRM: Fay, Sharpe, Fagan, Minnion & McKee, LLP

ABSTRACT:

A gradient coil assembly (22) generates substantially linear gradient magnetic fields through an examination region (14). The gradient coil assembly (22) includes a pair of primary gradient coil sets (22a, 22b) and a pair of shield coil sets (23a, 23b) which are disposed in an overlapping relationship. One gradient coil set is displaced relative to the other gradient coil set such that the mutual inductance between the two is minimized. Preferably, the coil sets (22a, 22b, 23a, 23b) are asymmetric, such that the sweet spot of each coil is displaced from the geometric center of each coil. One primary gradient coil set (22a) is a high efficiency, high switching speed coil to enhance performance of ultrafast magnetic resonance sequences, while the second primary gradient coil set (22b) is a low efficiency coil which generates a high quality gradient magnetic field, but with slower switching speeds. By displacing one gradient coil set relative to the other, mutual inductance is minimized, which maximizes peak gradient, rise time, and slew rate, while dB/dt levels are minimized. Arranging asymmetric gradient coil sets in an overlapping, phased array reduces coil resistance, which increases duty cycle and reduces heat dissipation to eliminate extra costs for a cooling system.

26 Claims, 20 Drawing figures

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw. Desc | Image

☐ 4. Document ID: US 20020050895 A1 Relevance Rank: 54

L9: Entry 2 of 8 File: PGPB May 2, 2002

PGPUB-DOCUMENT-NUMBER: 20020050895
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020050895 A1

TITLE: Magnetic apparatus for MRI

PUBLICATION-DATE: May 2, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Zuk, Yuval	Haifa		IL	
Katz, Yoav	Rehovot		IL	
Katznelson, Ehud	Ramat Yishai		IL	
Rotem, Haim	Mate Asher		IL	

US-CL-CURRENT: 335/216

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC | Draw. Desc | Image

☐ 5. Document ID: US 6163240 A Relevance Rank: 54

L9: Entry 5 of 8 File: USPT Dec 19, 2000

US-PAT-NO: 6163240
DOCUMENT-IDENTIFIER: US 6163240 A

TITLE: Magnetic apparatus for MRI

DATE-ISSUED: December 19, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Zuk; Yuval	Haifa			ILX
Katznelson; Ehud	Ramat Yishai			ILX
Katz; Yoav	Rehovot			ILX
Rotem; Haim	Mate Asher			ILX

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Odin Medical Technologies Ltd.	Yokneam Elite			ILX	03

APPL-NO: 9/ 161336
DATE FILED: September 25, 1998

PARENT-CASE:
REFERENCE TO RELATED APPLICATIONS: This application claims priority of and the benefit of U.S. provisional application Ser. No. 60/059,659, filed Sep. 25, 1997.

INT-CL: [7] H01 F 5/00, G01 V 3/00

US-CL-ISSUED: 335/299; 324/318, 324/319, 324/320, 335/296, 335/302, 335/306
US-CL-CURRENT: 335/299; 324/318, 324/319, 324/320, 335/296, 335/302, 335/306

FIELD-OF-SEARCH: 335/216, 335/296-306, 324/318-320, 600/410, 600/421, 600/422

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
H1615	December 1996	Leupold	
4341220	July 1982	Perry	
4608977	September 1986	Brown	
4695802	September 1987	Zijlstra	324/319
4829252	May 1989	Kaufman	
4862086	August 1989	Maeda	
4875485	October 1989	Matsutani	
5134374	July 1992	Breneman et al.	
5153517	October 1992	Oppelt et al.	324/322
5241272	August 1993	Friedrich	324/318
5304933	April 1994	Vavrek et al.	
5332971	July 1994	Aubert	
5365927	November 1994	Roemer et al.	
5390673	February 1995	Kikinis	
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5675305	October 1997	DeMeester et al.	335/302
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A description of,"HSP 50214 Harris Semiconductor Corporation ,FI, U.S.A" 1page, No Date.
Faulkner et al., "Guidelines for Establishing a Virtual Reality Lab", IEEE Engineering in Medicine and in Biology, Mar. Apr. 1996 pp. 86-93.

ART-UNIT: 282
PRIMARY-EXAMINER: Gellner; Michael L.
ASSISTANT-EXAMINER: Barrera; Raymond
ATTY-AGENT-FIRM: Eitan, Pearl, Latzer & Cohen-Zedek

ABSTRACT:

Magnetic apparatus for MRI/MRT probes and methods for construction thereof are disclosed. One embodiment includes a pair of opposed magnet assemblies defining an open region therebetween, a transmitting RF coil having at least a portion thereof disposed within the open region, at least one receiving RF coil disposed within the open region and X,Y and Z gradient coils. At least one of the X,Y and Z gradient coils is disposed outside of the open region. Another embodiment of the apparatus includes a single magnet assembly having a first surface and a second surface opposing the first surface, a transmitting RF coil having at least a portion thereof opposing the first surface, at least one receiving RF coil and X,Y and Z gradient coils. At least one of the X,Y and Z gradient coils opposes the second surface. In another embodiment the magnet assembly

generates a permanent z-gradient magnetic field and therefore includes only X and Y gradient coils, at least one of which opposes the second surface. The apparatuses may also include one or more shim coils.

21 Claims, 24 Drawing figures

☑ 6. Document ID: US 5760584 A Relevance Rank: 52

L9: Entry 7 of 8 File: USPT Jun 2, 1998

US-PAT-NO: 5760584
DOCUMENT-IDENTIFIER: US 5760584 A

TITLE: Shield for MR system RF coil provided with multiple capacitive channels for RF current flow

DATE-ISSUED: June 2, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Frederick; Perry S.	Waukesha	WI		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
General Electric Company	Milwaukee	WI			02

APPL-NO: 8/ 689948
DATE FILED: August 16, 1996

INT-CL: [6] G01 R 33/20

US-CL-ISSUED: 324/318
US-CL-CURRENT: 324/318

FIELD-OF-SEARCH: 335/301, 174/35R, 174/35MS, 324/300, 324/307, 324/309, 324/318

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4871969	October 1989	Roemer et al.	324/318
4879515	November 1989	Roemer et al.	324/318
5381093	January 1995	Kawamoto	324/318
5680046	October 1997	Ferderick et al.	324/318

ART-UNIT: 221
PRIMARY-EXAMINER: O'Shea; Sandra L.
ASSISTANT-EXAMINER: Eisenberg; Michael
ATTY-AGENT-FIRM: Skarsten; James O. Pilarski; John H.

ABSTRACT:

An RF shield is provided to prevent coupling between the gradient coils and the RF coil

of an MR imaging system, wherein the RF field rotates around the RF coil axis. The shield includes a number of coaxial conductive cylinders, and further includes a plurality of cylinders formed of dielectric material, each dielectric cylinder positioned between adjacent conductive cylinders. Each conductive cylinder is formed from sheets of copper, each sheet having a pattern of conductive loops formed therein, and each loop having an associated gap to prevent induction of eddy currents therein by gradient magnetic fields produced by the MR system gradient coils. The number of conductive cylinders, and the angular orientation thereof with respect to one another, are selected to provide a plurality of closed paths for RF image current induced by the RF field, wherein respective closed paths are established by capacitive coupling between a given conductive loop of a given conductive cylinder, and conductive loops in other of the conductive cylinders.

11 Claims, 7 Drawing figures

☐ 7. Document ID: US 5381093 A Relevance Rank: 49

L9: Entry 8 of 8 File: USPT Jan 10, 1995

US-PAT-NO: 5381093
DOCUMENT-IDENTIFIER: US 5381093 A

TITLE: Magnetic resonance imaging apparatus

DATE-ISSUED: January 10, 1995

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Kawamoto; Hiromi	Yaita			JPX

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Kabushiki Kaisha Toshiba	Kawasaki			JPX	03

APPL-NO: 7/ 986352
DATE FILED: December 7, 1992

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
JP	3-324780	December 9, 1991

INT-CL: [6] G01 R 33/20

US-CL-ISSUED: 324/318
US-CL-CURRENT: 324/318

FIELD-OF-SEARCH: 324/300, 324/307, 324/309, 324/310, 324/311, 324/312, 324/313, 324/314, 324/318, 324/319, 324/320, 324/322, 128/653.5

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4642569	February 1987	Hayes et al.	324/318
4879515	November 1989	Roemer et al.	324/318
4965521	October 1990	Egloff	324/312

ART-UNIT: 267
PRIMARY-EXAMINER: Tokar; Michael J.
ATTY-AGENT-FIRM: Limbach & Limbach

ABSTRACT:

The MR imaging apparatus comprises an RF shield for interposed between the set of gradient coil and the RF coil. The RF shield is a cylinder which longitudinal axis is substantially coincident to the z-axis in which a static magnetical field is applied. The RF shield comprises two conductive sheet-members which are half-cylinder respectively and integrated into one cylinder. The sheet members have a plurality of generally C-shaped conductive loop portions respectively which are defined by nonconductive lines parallel to RF current flow induced therein by the RF coil and a single radial cut line respectively. The RF shield comprises a connecting means for electrically connecting the C-shaped conductive loop portions so that the C-shaped conductive loop portion in one of the sheet members and corresponding C-shaped conductive loop portion in the other sheet member can be formed into one circuit respectively and a current can circulate in said circuit in the same direction around a y-axis orthogonal to the z-axis.

21 Claims, 10 Drawing figures

☐ 8. Document ID: US 5872452 A Relevance Rank: 48

L9: Entry 6 of 8 File: USPT Feb 16, 1999

US-PAT-NO: 5872452
DOCUMENT-IDENTIFIER: US 5872452 A

TITLE: Apparatus and method for the generation of gradient magnetic fields for high resolution NMR experiments

DATE-ISSUED: February 16, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Cory; David G.	Boston	MA		
Lewandowski; Joel T.	Oxford	MA		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Bruker Instruments, Inc.	Billerica	MA			02

APPL-NO: 8/ 794477
DATE FILED: February 4, 1997

INT-CL: [6] G01 V 3/00

US-CL-ISSUED: 324/321; 324/318
US-CL-CURRENT: 324/321; 324/318

FIELD-OF-SEARCH: 324/321, 324/320, 324/318, 324/314, 324/307, 324/309

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
5208536	May 1993	Cory	324/321
5260657	November 1993	Lewis et al.	324/321
5325059	June 1994	Doty	324/321

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Osamu Oishi et al., Institute for Molecular Science, Myodaiji, Okazaki 444, Japan, New PFG NMR Spectrometer with a Rotatable Quadrupole Coil for the Measurement of an Anisotropic Self-Diffusion Coefficient Tensor, Journal of Magnetic Resonance, XP 000633889, Series A 123, pp. 64-71 (1996), Article No. 0214.
Goran Odberg et al, Division of Physical Chemistry, The Royal Institute of Technology, S-100 44, Stockholm 70, Sweden, On the Use of a Quadrupole Coil for NMR Spin-Echo Diffusion Studies, Journal of Magnetic Resonance 16, XP-002064740, pp. 342-347 (1974).
R. Botwell, et al., Magic-Angle Gradient-Coil Design, Magnetic Resonance Center, University of Nottingham, Nottingham NG7 2RD United Kingdom, Journal of Magnetic Resonance, XP 000519712, Series A 115, pp. 55-59 (1995).
Seiichi Miyajima et al., Laboratory of Atomic and Solid Sate Physics, Cornell University, Ithaca, NY 14853-2501, USA, Pulsed-field-gradient stimulated-spin-echo NMR study of anisotropic self-diffusion in smectic Ad liquid crystal CBOOA.

ART-UNIT: 287
PRIMARY-EXAMINER: Arana; Louis
ATTY-AGENT-FIRM: Kudirka & Jobse, LLP

ABSTRACT:

A gradient magnetic field generator is provided for generating a spatially varying gradient magnetic field for use with a nuclear magnetic resonance spectroscopy probe having a rotatable sample container. The gradient field generator has a plurality of straight line conductive segments which lie parallel to one another and perpendicular to a plane within which lies a rotation axis about which the sample container rotates. The straight line conductive segments each conduct a current which generates a component of the overall gradient magnetic field. The conductive segments preferably lie in a cylindrical distribution about a stator within which the sample container is rotated. The appropriate currents for the conductive segments may be determined by finding a solution for the Jacobian which defines the magnetic field variations in the three-dimensional space of the stator. Finding an appropriate solution is simplified by presuming the cylindrical distribution of conductive segments and allowing restriction due to the size and shape of the stator, and the physical space between the stator and an inner surface of the probe housing.

19 Claims, 8 Drawing figures

Term	Documents
THREE.DWPI,TDBD,EPAB,JPAB,USPT,PGPB.	2002574
THREES.DWPI,TDBD,EPAB,JPAB,USPT,PGPB.	975
GRADIENT.DWPI,TDBD,EPAB,JPAB,USPT,PGPB.	171373
GRADIENTS.DWPI,TDBD,EPAB,JPAB,USPT,PGPB.	40550
COIL.DWPI,TDBD,EPAB,JPAB,USPT,PGPB.	717215
COILS.DWPI,TDBD,EPAB,JPAB,USPT,PGPB.	228330
(8 AND ((THREE ADJ GRADIENT) ADJ COIL)).USPT,PGPB,JPAB,EPAB,DWPI,TDBD.	8
(L8 AND (THREE ADJ GRADIENT ADJ COIL)).USPT,PGPB,JPAB,EPAB,DWPI,TDBD.	8

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